



Evolution of Cement Concrete Road in Highway: A Review

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ABSTRACT: -

In India major stage concrete road because concrete pavement can manage the complicated loads and environmental conditions that occur on roads, there is a rising trend toward its use worldwide. Under the combined action of axle loads and temperature difference throughout the depth of the slab, the pavement slab deteriorates. In this work, a case study for thickness design is illustrated, and the many criteria involved in designing stiff pavement with tied concrete shoulders for a national highway in Punjab State are described. It was thought about whether bottom-up and top-down cracking may occur. Variations in moisture have little impact on how warping strains develop. A pavement slab loses around 30% of its thickness. But recent developments in concrete paving technology have made transportation facilities better. Here, we'll talk about the development of concrete pavements over the years. Pavements made of concrete have a drawback in that they are expensive at first. However, with time, the concrete pavement seems to be more resilient. Almost every industrialized nation, as well as several emerging nations, uses concrete pavement on a regular basis. Finding methods and strategies to pave concrete more effectively and efficiently is therefore crucial. This requirement has been investigated, and new technology and apparatus have been created to meet it. It has been considered how to apply new, contemporary techniques.

Key Words: - Modern Techniques, Equipment, and History of Concrete Paving.

Introduction:-

"Concrete paving technique" refers to the skillful application of concrete over a flat area to create a smooth, usable surface. Typically, rigid pavement types are utilized to build highways and other sorts of similar roadways. An effective highway transportation system for moving people and products depends on its pavement. Without functioning pavements, the transportation system cannot operate, road users suffer due to greater expenses, longer travel and commuting times, and hazardous roads, and the economy as a whole suffers (in terms of higher costs for goods and commodities). It is a clear fact that modern civilizations cannot operate without mobility and that mobility need effective pavements. As a result, long-lasting pavements that can be built and maintained efficiently are crucial to the transportation system. These pavements should also be safer, smoother, and more ecologically friendly. The nation's roadway pavement infrastructure is built, maintained, preserved, and repaired annually at a cost of cores of rupees. The total amount invested on the paving of our roads is in the trillions of dollars.

The main objectives of concrete pavement engineering are:

1. Offer appropriate serviceability at a low price.
2. Offer the best serviceability attainable given the funding sources.
3. Maximum mobility for the cheapest price.

However, there are a few significant difficulties that the engineers must overcome. As follows:

1. Limited agency funding.
2. Improving numerous design elements that take into account regional requirements for material accessibility, environmental factors, site circumstances, and future traffic.
3. The amount of traffic in urban areas and the rules governing construction zones.
4. Factors related to pavement noise.
5. User requests for a smoother, safer ride.

6. Thorough knowledge of the variables influencing concrete pavement behaviour.
7. Creating concrete combinations that are durable.
8. The impact of the environment on both short- and long-term performance.
9. Sustainable development issues.

Literature reviews:-

In order to address the many traffic issues, several articles and studies have been produced in the topic of traffic control. Following are explanations of a few of these papers

Jannathul Thasni. P, JouharShareef. (2018) This research focuses on the cost and time management of storm water using pervious concrete. They research the use of pervious concrete, which was formerly used as a road paving material in metropolises. They said that due to issues with low ground water tables and storm water management in metropolitan areas, pervious concrete pavement is a novel idea in metro cities. One case study is examined in this essay. The appropriateness of a prior concrete was assessed by taking into account rainfall data, traffic volume data, soil & geotechnical investigation data of a residential colony that was used as a case study. The costs of managing storm water using the traditional approach versus managing storm water utilizing previously installed concrete pavement are compared. This document according to which the main consideration in big cities is cost. Cities with a big population find it challenging to maintain expensive storm water control systems. Additionally, they claim that older concrete pavement is irreplaceable and an efficient way to fulfill demographic and environmental needs.

Dr. R. Kuma.2020 This document summarizes studies on porous concrete's ability to absorb water and discusses solutions for low ground water levels, agricultural issues, and storm water runoff control. Application and engineering characteristics of porous concrete are explored, and the components of porous pavement, including cement, aggregates, water, and additives, are also studied. Additionally addressed are the advantages, disadvantages, strength, and durability of porous concrete. In this work, the substitution of cement with fly ash is discussed. This results in the safe disposal of waste in porous concrete, making the pavement eco-friendly.

Pandey, B.B. 2017 They have done research in rural areas. Perforated concrete, according to them, is a relatively new idea for rural road paving. Agriculture issues as a result of rising ground water levels. Concrete from earlier construction projects is utilised for pavement. They claim that in rural areas, cost consideration is a crucial element that must be taken into account. Therefore, expensive storm water control techniques are not appropriate in rural locations. They come to the conclusion that the best option is to collect rainfall and let it sink into the earth. By doing away with the need for associated ponds, booms, and other expensive storm water management measures, this pavement technique enables more effective land use.

Srinivas, T., Suresh, K. and Pandey, B.B 2020 For the purpose of managing storm water runoff and preventing pollution, they took it into account while designing the perforated pavement for highways. The main conclusions of these studies have been discussed and summarized. These studies have examined the hydraulic performance of permeable pavement, the permeability of porous asphalt and previously paved concrete surfaces, the clogging of permeable pavement surfaces, and issues with water quality and pollution control. According to them, an integrated sustainable mobility programmer would eventually include permeable pavements, such as the Full Depth Permeable Pavement (FDPP). They claim that FDPP-designed property might be utilized as a substitute best management practice (BMP) for managing storm water runoff. They claim that the unique properties of FDPP persist throughout the lifespan of pavements.

Bradbury, R. D et al. 2015 This article reports on an experimental investigation on how the properties of concrete's pore network affect its transport properties. The observed transport coefficients are influenced by the total amount of porosity, pore size, pore connectedness, and pore saturation (Garboczi 1990; Bentz et al. 1999) Sustainable development for the environment has been the subject of extensive research. The major cause of this is the substitution of pervious concrete for traditional concrete. Negative environmental consequences have been handled and reduced with the use of pervious concrete. Concrete is made with voids to allow water to escape through the material, which also helps to prevent water logging, increase the water table, and make a road surface less skid-resistant. Concrete with permeable properties and the substance utilized.

Construction techniques for concrete pavement:-

Preparation of the base layer:-

The subgrade of a rigid pavement must be properly constructed in order to provide an acceptable and consistent thickness throughout the pavement structure. For the pavement structure to function as a single unit, this creates a homogenous link between the concrete slab and its earth basis. Drainage of the water is necessary for pavements with a base layer. To avoid a discontinuity, all materials like dirt and leaves must be eliminated. In order to stop the mixing water from draining out of the concrete, the porous base of the pavement should be watered.

- ❖ The subgrade must be well compacted, with any surface water properly drained, any ruts left by construction traffic filled up, and the subgrade given an additional surface width for lateral stability.

Batching Of Concrete For Paving Construction

Concrete mixing plants must have the capacity to provide concrete to the paving equipment constantly in order to be used for road building. Both the dose of the additives and the proportioning of the mix's elements should be precise. At least as many varied aggregate fractions must be present as aggregate feed bins. The material loading machinery must be in good working order and have the capacity to fill the bins continually. The loaders' buckets cannot be broader than the bins. The water tank and cement silos' contents are proportional to the rates of production.

There are four main, widely used types of pavements:

1. Pavements with precast pretension
2. Traditional concrete paving
3. Roller compacted pavements
4. Concrete pavement that is permeable or porous Crete pavement that is permeable or porous

Conclusion on Literature:-

- Thus, it can be inferred from all the data and research that concrete pavement has shown to be beneficial to humankind.
- Concrete pavements have improved the speed and convenience of the transportation system. Additionally, concrete pavements may be built easily and fast.
- Even though they could be expensive at first, they end up being more practical over time.
- The methods for paving concrete have changed since they were first used.
- Pavements are easier and more precisely made by man now than ever before.
- The improvements in concrete paving technology research deserve all the credit. And as automation spreads, we may expect to see additional advancements in concrete paving technology.

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